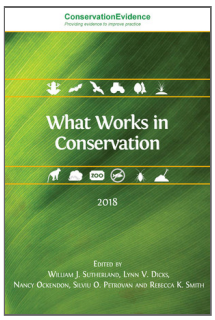

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What Works in Conservation 2018

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3.9 Threat: Natural system modifications

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3.9 Threat: Natural system modifications

Based on the collated evidence, what is the current assessment of the effectiveness of interventions for natural system modifications?	
Likely to be beneficial	● Create scrapes and pools in wetlands and wet grasslands ● Provide deadwood/snags in forests: use ring-barking, cutting or silvicides ● Use patch retention harvesting instead of clearcutting
Trade-off between benefit and harms	● Clear or open patches in forests ● Employ grazing in artificial grassland/pastures ● Employ grazing in natural grasslands ● Employ grazing in non-grassland habitats ● Manage water level in wetlands ● Manually control or remove midstorey and ground-level vegetation: forests ● Manually control or remove midstorey and ground-level vegetation: mow or cut natural grasslands ● Manually control or remove midstorey and ground-level vegetation: mow or cut semi-natural grasslands/pastures ● Manually control or remove midstorey and ground-level vegetation: shrubland ● Raise water levels in ditches or grassland ● Thin trees within forests

	• Use prescribed burning: grasslands • Use prescribed burning: pine forests • Use prescribed burning: savannahs • Use prescribed burning: shrublands • Use selective harvesting/logging instead of clearcutting
Unknown effectiveness (limited evidence)	• Clearcut and re-seed forests • Coppice trees • Fertilise grasslands • Manage woodland edges for birds • Manually control or remove midstorey and ground-level vegetation: reedbeds • Manually control or remove midstorey and ground-level vegetation: savannahs • Plant trees to act as windbreaks • Plough habitats • Provide deadwood/snags in forests: add woody debris to forests • Remove coarse woody debris from forests • Replace non-native species of tree/shrub • Re-seed grasslands • Use environmentally sensitive flood management • Use fire suppression/control • Use greentree reservoir management • Use prescribed burning: Australian sclerophyll forest • Use shelterwood cutting instead of clearcutting • Use variable retention management during forestry operations
Likely to be ineffective or harmful	• Apply herbicide to mid- and understorey vegetation • Treat wetlands with herbicides • Use prescribed burning: coastal habitats • Use prescribed burning: deciduous forests
No evidence found (no assessment)	• Protect nest trees before burning

Likely to be beneficial

Create scrapes and pools in wetlands and wet grasslands

Four out of six studies from the UK and North America found that more bird used sites, or breeding populations on sites increased, after ponds or scrapes were created. A study from the USA found that some duck species used newly created ponds and others used older ponds. A study from the UK found that northern lapwing chicks foraged in newly created features and that chick condition was higher in sites with a large number of footdrains. *Assessment: likely to be beneficial (effectiveness 75%; certainty 60%; harms 0%).*

http://www.conservationevidence.com/actions/359

Provide deadwood/snags in forests (use ring-barking, cutting or silvicides)

One of five studies found that forest plots provided with snags had higher bird diversity and abundance than plots without snags. Three of four studies from the USA and UK found that species used artificially-created snags for nesting and foraging. One study from the USA found that use increased with how long a snag had been dead. *Assessment: likely to be beneficial (effectiveness 45%; certainty 50%; harms 0%).*

http://www.conservationevidence.com/actions/343

Use patch retention harvesting instead of clearcutting

One of two studies (from the USA) found that areas under patch retention harvesting contained more birds of more species than clearcut areas, retaining similar numbers to unharvested areas. Two studies found that forest specialist species were found more frequently in patch retention plots than under other management. Habitat generalists declined on patch retention sites compared to other managements. *Assessment: likely to be beneficial (effectiveness 70%; certainty 46%; harms 0%).*

http://www.conservationevidence.com/actions/330

Trade-off between benefit and harms

Clear or open patches in forests

Seven out of nine studies from the UK and USA found that early-successional species increased in clearcut areas of forests, compared to other management. Two studies found that mature-forest species declined. One study found no differences in species richness between treatments, another found no consistent differences. A study from the USA found that a mosaic of cut and uncut areas supported a variety of species. *Assessment: trade-offs between benefits and harms (effectiveness 55%; certainty 60%; harms 30%).*

http://www.conservationevidence.com/actions/326

Employ grazing in artificial grasslands/pastures

Five studies from the UK and USA found use or nesting densities were higher in grazed compared to ungrazed areas. A study from Canada found an increase in duck populations following the start of grazing along with other interventions. Eight studies from the UK, Canada and the USA found species richness, community composition, abundances, use, nesting densities, nesting success or productivity were similar or lower on grazed compared with ungrazed areas. One found that several species were excluded by grazing. *Assessment: trade-offs between benefits and harms (effectiveness 43%; certainty 65%; harms 45%).*

http://www.conservationevidence.com/actions/349

Employ grazing in natural grasslands

Five of 12 studies from the USA and Canada found that densities of some species were higher on grazed than ungrazed sites. Eight studies from the USA, Canada and France found that some or all species studied were found at similar or lower densities on grazed compared to ungrazed sites or those under other management. Two controlled studies from the USA and Canada found that nesting success was higher on grazed than ungrazed sites. Five studies from the USA and Canada found that nesting success was similar or lower on grazed sites. *Assessment: trade-offs between benefits and harms (effectiveness 40%; certainty 60%; harms 50%).*

http://www.conservationevidence.com/actions/348

Employ grazing in non-grassland habitats

One of eight studies found more bird species on grazed than unmanaged sites, apart from in drought years. A study from the Netherlands found the number of species in a mixed habitat wetland site declined with increased grazing. Three studies in Sweden, the Netherlands and Kenya found that the overall abundance or densities of some species were higher in grazed than ungrazed sites. Four studies in Europe and Kenya found that some species were absent or at lower densities on grazed compared to ungrazed sites or those under different management. Five studies from across the world found no differences in abundances or densities of some or all species between grazed sites and those that were ungrazed or under different management. Two studies from the UK found that productivity was lower in grazed than ungrazed sites. A study from the UK found that songbirds and invertebrate-eating species, but not crows were more common on rough-grazed habitats than intensive pasture. *Assessment: trade-offs between benefits and harms (effectiveness 40%; certainty 67%; harms 40%).*

http://www.conservationevidence.com/actions/350

Manage water level in wetlands

Three studies (of six) from the USA, UK and Canada found that different species were more abundant at different water heights. One found that diversity levels also changed. One study found that great bitterns in the UK established territories earlier when deep water levels were maintained, but productivity did not vary. A study from Spain found that water management successfully retained water near a greater flamingo nesting area, but did not measure the effects on productivity or survival. *Assessment: trade-offs between benefits and harms (effectiveness 40%; certainty 41%; harms 35%).*

http://www.conservationevidence.com/actions/355

Manually control or remove midstorey and ground-level vegetation (including mowing, chaining, cutting etc.) (forests)

Seven studies from Europe and the USA found that species richness, total density or densities of some species were higher in areas with mid- or understorey management compared to areas without management. Four studies also used other interventions. Seven studies from the USA and

Canada found that species richness, densities, survival or competition for nest sites were similar or lower in areas with mid- or understorey control. Two studies investigated several interventions at once. Two studies from Canada found higher nest survival in forests with removal of deciduous trees compared to controls. One study found that chicks foraging success was higher in areas with cleared understorey vegetation compared to burned areas, but lower than under other managements. *Assessment: trade-offs between benefits and harms (effectiveness 40%; certainty 75%; harms 40%).*

http://www.conservationevidence.com/actions/335

Manually control or remove midstorey and ground-level vegetation (including mowing, chaining, cutting etc.) (mowing or cutting natural grasslands)

Two of six studies found higher densities of birds or nests on mown grasslands compared to unmanaged or burned areas. Two studies found lower densities or nests of some species and two found no differences in nesting densities or community composition on mown compared to unmown areas. One study from the USA found that grasshopper sparrow nesting success was higher on mown than grazed areas. One study from the USA found that duck nesting success was similar on cut and uncut areas. *Assessment: trade-offs between benefits and harms (effectiveness 40%; certainty 50%; harms 39%).*

http://www.conservationevidence.com/actions/338

Manually control or remove midstorey and ground-level vegetation (including mowing, chaining, cutting etc.) (mowing or cutting semi-natural grasslands/pastures)

One of four studies found that wader populations increased following annual cutting of semi-natural grasslands. One study from the UK found that ducks grazed at higher densities on cut areas. Another study in the UK found that goose grazing densities were unaffected by cutting frequency. One study from the USA found that Henslow's sparrows were more likely to be recaptured on unmown than mown grasslands. *Assessment: trade-offs between benefits and harms (effectiveness 40%; certainty 40%; harms 20%).*

http://www.conservationevidence.com/actions/339

Manually control or remove midstorey and ground-level vegetation (including mowing, chaining, cutting etc.) (shrublands)

One of seven studies found that overall bird diversity and bird density was similar between chained areas, burned areas and controls. One found that overall diversity and abundance was lower on mown sites than controls, but that grassland-specialist species were present on managed sites. Five studies from the USA and Europe found than some species were at greater densities or abundances on sites with mechanical vegetation control than on sites with burning or no management. Three studies from the USA found that some species were less abundant on sites with mechanical vegetation removal. One study from the USA found no differences between areas cut in winter and summer. *Assessment: trade-offs between benefits and harms (effectiveness 43%; certainty 54%; harms 30%).*

http://www.conservationevidence.com/actions/337

Raise water levels in ditches or grassland

One of seven studies found that three waders were found to have recolonised a UK site or be found at very high densities after water levels were raised. Three studies from Europe found that raising water levels on grassland provided habitat for waders. A study from Denmark found that oystercatchers did not nest at higher densities on sites with raised water levels. A study from the UK found that birds visited sites with raised water levels more frequently than other fields, but another UK study found that feeding rates did not differ between sites with raised water levels and those without. A study from the USA found that predation rates on seaside sparrow nests increased as water levels were raised. *Assessment: trade-offs between benefits and harms (effectiveness 65%; certainty 55%; harms 25%).*

http://www.conservationevidence.com/actions/354

Thin trees within forests

One study of 14 (from the USA) found higher bird species richness in sites with tree thinning and several other interventions, compared to unmanaged sites. Three studies from the UK and USA found no such differences. Seven studies (four investigating multiple interventions) found that overall bird abundance or the abundance of some species was higher in thinned

plots, compared to those under different management. Five studies found that found that abundances were similar, or that some species were less abundant in areas with thinning. Two studies from the USA found no effect of thinning on wood thrushes, a species thought to be sensitive to it. A study from the USA found that a higher proportion of nests were in nest boxes in a thinned site, compared to a control. A study from the USA found no differences in bird abundances between burned sites with high-retention thinning, compared to low-retention sites. *Assessment: trade-offs between benefits and harms (effectiveness 50%; certainty 60%; harms 30%).*

http://www.conservationevidence.com/actions/328

Use prescribed burning (grasslands)

Four of 21 studies found that overall species richness and community composition did not vary between burned and unburned sites. Nine studies from across the world found that at least some species were more abundant or at higher densities in burned than unburned areas or areas under different management. Fourteen studies found that at least one species was at similar or lower abundances on burned areas. Responses varied depending on how soon after fires monitoring occurred. One study from the USA found that Florida grasshopper sparrow had significantly higher reproductive success soon after burns, whilst another found that dickcissel reproductive success was higher in patch-burned than burned and grazed areas. *Assessment: trade-offs between benefits and harms (effectiveness 45%; certainty 60%; harms 40%).*

http://www.conservationevidence.com/actions/322

Use prescribed burning (pine forests)

Four of 28 studies in the USA found higher species richness, densities or abundances in sites with prescribed burning, tree thinning and in one case mid- or understorey control compared to controls. Fourteen studies found that some species were more abundant, or had higher productivities or survival in burned or burned and thinned areas than control areas. One study found that effects varied with geography and habitat. Fifteen studies found no differences in species richness or densities, community composition, productivity, behaviour or survival between sites with prescribed burning or burning and thinning, and controls or sites with

other management. One study found that foraging success of chicks was lower in burned areas. Three studies found effects did not vary with burn season. *Assessment: trade-offs between benefits and harms (effectiveness 50%; certainty 77%; harms 35%).*

http://www.conservationevidence.com/actions/318

Use prescribed burning (savannahs)

One of five studies found that burned areas of savannah tended to have more birds and species than control or grazed areas, although burned sites showed significant annual variation unlike grazed sites. A study from Australia found that effects on bird abundances depended on burn season and habitat type. Two studies in the USA found that some open country species were more common in burned areas than unburned. A study from the USA found that two eastern bluebirds successfully raised chicks after a local prescribed burn. *Assessment: trade-offs between benefits and harms (effectiveness 40%; certainty 50%; harms 35%).*

http://www.conservationevidence.com/actions/320

Use prescribed burning (shrublands)

One of eight studies found that overall bird densities were similar between burned and unburned areas, whilst another found that species numbers and densities did not vary between areas burned in summer or winter. Three studies found that some species were more abundant on areas that were burned. Four found that species densities were similar or lower on burned compared to control areas or those under different management. One study found that sage sparrows chose different nest sites before and after burning. Another found no differences in greater sage grouse movement between burned and unburned areas. *Assessment: trade-offs between benefits and harms (effectiveness 43%; certainty 50%; harms 45%).*

http://www.conservationevidence.com/actions/321

Use selective harvesting/logging instead of clearcutting

Six of seven studies from the USA and Canada found that some species were more, and other less, abundant in selectively logged forests compared to unlogged stands, or those under other management. One study found that differences between treatments were not consistent. A study from

the USA found that species richness of cavity-nesting birds was lower in selectively logged forests than in clearcuts. One study from the USA found that brood parasitism was higher in selectively logged forests for two species and lower for two others, compared to control stands. *Assessment: trade-offs between benefits and harms (effectiveness 65%; certainty 60%; harms 30%).*

http://www.conservationevidence.com/actions/331

Unknown effectiveness (limited evidence)

Clearcut and re-seed forests

One of two studies from the USA found that stands of pines replanted with native species held more species typical of scrub habitats than stands under different management. The other study found similar bird densities in clearcut and re-seeded sites and those under different management. *Assessment: unknown effectiveness — limited evidence (effectiveness 30%; certainty 35%; harms 0%).*

http://www.conservationevidence.com/actions/327

Coppice trees

One of three studies found a population increase in European nightjars on a UK site after the introduction of coppicing and other interventions. Two studies from the UK and USA found that the use of coppices by some bird species declined over time. A UK study found that species richness decreased with the age of a coppice, but that some species were more abundant in older stands. *Assessment: unknown effectiveness — limited evidence (effectiveness 34%; certainty 30%; harms 30%).*

http://www.conservationevidence.com/actions/329

Fertilise grasslands

All four studies captured (all from the UK) found that more geese grazed on fertilised areas of grass more than control areas. Two investigated cutting and fertilizing at the same time. One study found that fertilised areas were used less than re-seeded areas. One study found that fertilisation had an effect at applications of 50 kg N/ha, but not at 18 kg N/ha. Another found that the effects of fertilisation did not increase at applications over 80 kg N/ha.

Assessment: unknown effectiveness — limited evidence (effectiveness 60%; certainty 35%; harms 7%).

http://www.conservationevidence.com/actions/353

Manage woodland edges for birds

One of three studies found that a local population of European nightjars increased at a UK site following the start of a management regime that included the management of woodland edges for birds. Two studies of an experiment in the USA found that bird abundance (but not species richness or nesting success) was higher in woodland edges managed for wildlife than unmanaged edges. *Assessment: unknown effectiveness — limited evidence (effectiveness 55%; certainty 39%; harms 30%).*

http://www.conservationevidence.com/actions/334

Manually control or remove midstorey and ground-level vegetation (including mowing, chaining, cutting etc.) (reedbeds)

One of three studies found that warblers nested at lower densities in cut areas of reeds. Productivity and success did not vary between treatments. A study from Denmark found that geese grazed at the highest densities on reedbeds cut 5–12 years previously. One study in the UK found that cutting reeds and changing water levels did not affect great bittern breeding productivity, but did delay territory establishment. *Assessment: unknown effectiveness — limited evidence (effectiveness 15%; certainty 36%; harms 14%).*

http://www.conservationevidence.com/actions/340

Manually control or remove midstorey and ground-level vegetation (including mowing, chaining, cutting etc.) (savannahs)

A study in Argentina found that in summer, but not overall, bird abundance and species richness was lower in an area where shrubs were removed compared to a control. Community composition also differed between treatments. *Assessment: unknown effectiveness — limited evidence (effectiveness 30%; certainty 10%; harms 30%).*

http://www.conservationevidence.com/actions/336

Plant trees to act as windbreaks

One of two studies found that a population of European nightjars increased at a UK site after multiple interventions including the planting of windbreak trees. A study from the USA found that such trees appeared to disrupt lekking behaviour in greater prairie chickens. *Assessment: unknown effectiveness — limited evidence (effectiveness 12%; certainty 25%; harms 20%).*

http://www.conservationevidence.com/actions/351

Plough habitats

One of four studies found that bird densities were higher on ploughed wetlands in the USA than unploughed ones. Three studies of one experiment in the UK found that few whimbrels nested on areas of heathland ploughed and re-seeded, but that they were used for foraging in early spring. There were no differences in chick survival between birds that used ploughed and re-seeded heathland and those that did not. *Assessment: unknown effectiveness — limited evidence (effectiveness 25%; certainty 36%; harms 10%).*

http://www.conservationevidence.com/actions/358

Provide deadwood/snags in forests (adding woody debris to forests)

One study from Australia found that brown treecreeper numbers were higher in plots with large amounts of dead wood added compared to plots with less or no debris added. *Assessment: unknown effectiveness — limited evidence (effectiveness 50%; certainty 29%; harms 0%).*

http://www.conservationevidence.com/actions/344

Remove coarse woody debris from forests

Two studies from the USA found that some species increased in sites with woody debris removal. One found that overall breeding bird abundance and diversity were lower in removal plots; the other that survival of black-chinned hummingbird nests was lower. *Assessment: unknown effectiveness — limited evidence (effectiveness 10%; certainty 33%; harms 60%).*

http://www.conservationevidence.com/actions/345

Replace non-native species of tree/shrub

A study from the USA found that the number of black-chinned hummingbird nests increased after fuel reduction and the planting of native species, but that the increase was smaller than at sites without planting. *Assessment: unknown effectiveness — limited evidence (effectiveness 5%; certainty 18%; harms 0%).*

http://www.conservationevidence.com/actions/341

Re-seed grasslands

One of two studies from the UK found that geese grazed at higher densities on re-seeded grasslands than on control or fertilised grasslands. Another study from the UK found that geese grazed at higher densities on areas sown with clover, rather than grass seed. *Assessment: unknown effectiveness — limited evidence (effectiveness 35%; certainty 19%; harms 0%).*

http://www.conservationevidence.com/actions/352

Use environmentally sensitive flood management

One of two studies found more bird territories on a stretch of river in the UK with flood beams, compared to a channelized river. The other found that 13 out of 20 species of bird increased at sites in the USA where a river's hydrological dynamics were restored. *Assessment: unknown effectiveness — limited evidence (effectiveness 41%; certainty 26%; harms 0%).*

http://www.conservationevidence.com/actions/356

Use fire suppression/control

All three studies we captured, from the USA, UK and Australia, found that some bird species increased after fire suppression, and in one case that woodland species appeared in a site. Two studies (from the UK and USA) found that some species declined following fire suppression. The USA study identified open country species as being negatively affected. *Assessment: unknown effectiveness — limited evidence (effectiveness 35%; certainty 34%; harms 30%).*

http://www.conservationevidence.com/actions/324

Use greentree reservoir management

A study from the USA found that fewer mid- and under-storey birds were found at a greentree reservoir site than at a control site. Canopy-nesting species were not affected. *Assessment: unknown effectiveness — limited evidence (effectiveness 0%; certainty 10%; harms 40%).*

http://www.conservationevidence.com/actions/357

Use prescribed burning (Australian sclerophyll forest)

Two of three studies from Australia found no differences in bird species richness in burned sites compared to unburned areas. All three found differences in species assemblages, with some species lost and others gained from areas after fire. *Assessment: unknown effectiveness — limited evidence (effectiveness 30%; certainty 31%; harms 30%).*

http://www.conservationevidence.com/actions/319

Use shelterwood cutting instead of clearcutting

A study from the USA found that bird community composition differed between shelterwood stands and those under other forestry practices: some species were more abundant, others less so. *Assessment: unknown effectiveness — limited evidence (effectiveness 40%; certainty 20%; harms 40%).*

http://www.conservationevidence.com/actions/333

Use variable retention management during forestry operations

A study from the USA found that nine species were more abundant and five less so in stands under variable retention management, compared to unmanaged stands. *Assessment: unknown effectiveness — limited evidence (effectiveness 45%; certainty 20%; harms 25%).*

http://www.conservationevidence.com/actions/332

Likely to be ineffective or harmful

Apply herbicide to mid- and understorey vegetation

One of seven studies from North America found that bird species richness in a forest declined after deciduous trees were treated with herbicide. Three studies found increases in total bird densities, or those of some species, after herbicide treatment, although one found no differences between treatment and control areas. One study found that densities of one species decreased and another remained steady after treatment. Three studies found that nest survival was lower in herbicide-treated areas and one found lower nesting densities. One study found that northern bobwhite chicks higher had foraging success in forest areas treated with herbicide compared to under other managements. *Assessment: likely to be ineffective or harmful (effectiveness 20%; certainty 50%; harms 60%).*

http://www.conservationevidence.com/actions/346

Treat wetlands with herbicides

All four studies from the USA found higher densities of birds in wetlands sprayed with herbicide, compared with unsprayed areas. Two found that some species were at lower densities compared to unsprayed areas or those under other management. *Assessment: likely to be ineffective or harmful (effectiveness 30%; certainty 42%; harms 40%).*

http://www.conservationevidence.com/actions/347

Use prescribed burning (coastal habitats)

One study from the USA found that breeding seaside sparrow numbers decreased the year a site was burned, but were higher than on an unburned site the following year. One study in Argentina found that tall-grass specialist species were lost from burned areas in the year of burning, but that some habitats recovered by the following year. One study from the USA found no differences in nest predation rates between burned and unburned areas for two years after burning. *Assessment: likely to be ineffective or harmful (effectiveness 20%; certainty 40%; harms 30%).*

http://www.conservationevidence.com/actions/323

Use prescribed burning (deciduous forests)

One of four studies found that bird species richness was similar in burned and unburned aspen forests, although relative abundances of some species changed. A study in the USA found no changes in community composition in oak and hickory forests following burning. One study in the USA found no differences in wood thrush nest survival in burned and unburned areas. Another study in the USA found a reduction in black-chinned hummingbird nests following fuel reduction treatments including burning. *Assessments: likely to be ineffective or harmful (effectiveness 32%; certainty 60%; harms 30%).*

http://www.conservationevidence.com/actions/317

No evidence found (no assessment)

We have captured no evidence for the following interventions:

- Protect nest trees before burning